

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**CONNECTICUT / RHODE ISLAND**

**UNDERGROUND OUTLET**

(Feet)

**CODE 620**

**DEFINITION**

A conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.

**PURPOSE**

Dispose of excess water from terraces, diversions, subsurface drains, surface drains, or other concentrations without causing damage by erosion or flooding.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where: (1) excess surface water needs to be disposed of; (2) a buried outlet is needed for Diversions (362), Terraces (600), or similar practices; (3) an underground outlet can be installed that will safely dispose of excess water; and (4) surface outlets are impractical because of stability problems, climatic conditions, land use, or equipment traffic.

**CRITERIA**

**Capacity.** The underground outlet shall be designed, alone or in combination with other practices, with adequate capacity to insure that the terrace, diversion, or other practices function according to the standard for the specific practice. For example, an underground outlet can be used in combination with a grassed waterway or a surface drain to carry part of the design flow. As a minimum, the design capacity of the underground outlet (with surface water conveyance supplement, if applicable) shall be the peak flow from a 10

year 24 hour Type III rainfall event. For urban / suburban applications, the minimum capacity shall be a 25 year frequency. The capacity of the underground outlet for natural or constructed basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements. Outlet capacities for basins shall be sized using routing procedures.

**Inlet.** An inlet can be a collection box, drop inlet, catch basin, perforated riser, or other appropriate device. Its capacity shall be adequate to provide the maximum design flow in the conduit. Flow-control devices shall be installed as necessary. Perforated risers must be of durable material, structurally sound, and resistant to damage by rodents or other animals. If burning of vegetation is likely to create a fire hazard, the inlet shall be fire resistant. Blind inlets can be used where they are effective. Collection boxes must be large enough to facilitate maintenance and cleaning operations. The inlet must have an appropriate trash guard to insure that trash or other debris entering the inlet passes through the conduit without plugging. For pipes less than 10-inch diameter, animal guards shall be considered.

Pressure-relief wells shall be designed and installed as needed to control pressure. If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

**Hydraulics.** Underground outlets shall be continuous conduits, or tubing. Joints shall be hydraulically smooth, and the materials and methods used shall be recommended by the

manufacturer. If a pressure system is used, joints shall be adequate to withstand the design pressure, including surges and vacuum. Thrust blocks shall be designed and installed as needed. The maximum velocity shall not exceed the safe velocity for the conduit materials and installation.

Lines shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. Positive grade shall be maintained in all sections of an underground outlet. Capacity shall be based on the pipe size or on other flow control devices to prevent water from the upper inlets from discharging through the lower inlets. The minimum conduit diameter shall be 4 inches.

**Materials.** Materials shall meet or exceed the design requirements against leakage and shall withstand internal pressure or vacuum and external loading. Plastic, concrete, aluminum, and steel shall meet the requirements specified in the applicable ASTM standard. All materials specified for Subsurface Drains (606) can be used for underground outlets. Conduits, however, can be perforated or nonperforated, depending on the design requirements. A filter fabric wrap (sock) or equivalent well-graded sand or gravel shall be used if migration of soil particles around perforated conduit is anticipated. All exposed plastic materials shall be protected from degradation due to exposure to sunlight.

**Loading Conditions.** Conduits shall be designed to withstand all anticipated live and dead loads. In urban / suburban applications, HS-20 live loading shall be used. The minimum depth of cover over the top of the conduit shall be 2 feet unless detailed computations permit less for the specific pipe installed

**Outlet.** The outlet shall be sufficiently stable for all anticipated flow conditions. It shall be designed for the maximum anticipated water surface at design flow. A 10-foot long continuous section of non-perforated conduit or a headwall can be used at the outlet. If a closed conduit is used, it shall be durable and strong enough to withstand all anticipated loads, including those caused by ice. Outlets shall not be placed in areas of active erosion. Pipe outlets shall be protected from erosion

and headcutting by installing plunge pools, level spreaders, armored outlet channels, or other stabilization means. If fire is a hazard, the outlet shall be fire resistant. Outlets less than 10-inch diameter shall have animal guards to prevent the entry of rodents or other animals.

**Protection.** All disturbed areas shall be reshaped and regraded so that they blend with the surrounding land features and conditions. Areas that are not to be farmed or covered by structural works shall be established to vegetation or otherwise protected from erosion as soon as practicable after construction.

## CONSIDERATIONS

Consider effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

Consider effects on the volume of downstream flow that might cause undesirable environmental, social, or economic effects.

Evaluate potential use for water management.

Consider effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances that would be carried by runoff.

Consider effects on the visual quality of downstream water resources.

Consider the construction-related effects on the quality of downstream watercourses.

Consider effects on wetlands or water-related wildlife habitats.

Evaluate potential impact on water quality due to agri-chemicals in outflow.

Consider depth of underground outlet in regard to tillage equipment depth and maintenance, if applicable.

## PLANS AND SPECIFICATIONS

Plans and specifications for installing underground outlets shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose. Plans and specifications shall include plan views, profiles,

cross-sections, and other documents. To the extent practical, specifications shall conform with national engineering Handbook Sections 642 and 643 (formerly NEH, Section 20).

### **AS BUILT DRAWINGS**

As built drawings shall be prepared showing all materials, pertinent elements and elevations as actually installed. Copies of the as built drawings shall be provided to the owner / operator and regulatory agency (if permits were required) upon construction completion.

### **OPERATION AND MAINTENANCE**

Underground outlets shall be maintained by:

- Keeping inlets, trash guards, and collection boxes and structures clean and free of materials that can reduce the flow
- Repairing leaks and broken or crushed lines to insure proper functioning of the conduit
- Checking outlet conduit and animal guards to ensure proper functioning of the conduit
- Keeping adequate backfill over the conduit
- Repairing any eroded areas at the pipe outlet